Islands, where it is a serious hindrance to the men employed in collecting the eggs of the Murre (*Uria Brunnichii* which breeds there in countless numbers. The traffic in their eggs between these islands and San Francisco alone reaches annually the sum of between one and two thousand dollars. The egg-hunters meet at one o'clock every day during the season (from May to July) with the exception of Sundays and Thursdays, and at a given signal, so that each may have an equal chance in gathering the spoil, start off for the most productive egging grounds. The gulls understanding, it would seem, what is to occur, hover overhead, awaiting the advance of the men, who rush eagerly into the rookeries. The affrighted Murres have scarcely risen from their nests, before the gull, with remarkable instinct, flying but a few paces ahead of the hunter, alights on the ground, tapping such eggs as the short time will allow before the egger comes up with him. The broken eggs are passed by the men, who remove only those which are sound. The gull then returning to the field of its exploits, procures a plentiful supply of its favourite food. Dr. Heermann says that he once saw three gulls scientifically approach a single Murre sitting on her egg. Two of them feigning an attack in front, the Murre raised herself to repel them; instantly the third advancing from the rear seized her solitary egg from beneath her, and flew off with the booty, the two first immediately following to claim their share. The egg was dropped and broke on the rocks, when a general scramble ensued between the three robbers for the valued prize.

AMONG the plants which have received honour and religious veneration among the Hindoos, the Doob-grass (*Cynodon dactylon*) holds a prominent place. Its usefulness, added to its beauty, induced them in their earliest ages to consider it the abode of a benevolent nymph, and it is employed in many of their religious ceremonies. It owes much of its honour to its great tenacity of life, being regarded as an emblem of immortality; and the Véda celebrates it, under one of its names, in words which indicate its supposed mystic origin :—"May *Durvà*, which rose from the water of life, which has a hundred roots and a hundred stems, efface a hundred of my sins, and prolong my existence for a hundred years." The extreme rapidity of growth in this grass is here referred to, and it is stated that, by merely chopping it in pieces and sprinkling these on prepared ground, a verdant sward may be obtained in a few weeks. The Doob-grass is frequently introduced by name in the popular stories of the country, and the roots are esteemed medicinal.

IN the northern district of Alaska the various grasses, which form an important portion of the vegetation, are woven into mats, dishes, articles of summer clothing, such as socks, mittens, and hats, by the Indians and Esquimaux. Mr. W. H. Dall states in his report upon the resources of that region, that in winter the grasses are neatly tied in bunches, and shaped to correspond with the foot; they are then placed between the foot and the sealskin sole of the winter boots worn in that country. "There they serve as a non-conductor, keeping the foot dry and warm, and protecting it from contusion to an extent which the much-lauded moccasins of the Hudson Bay men never do. In fact, I believe the latter to be, without exception, the worst, most uncomfortable, and least durable covering for the foot worn by mortal man."

AMONG other South American districts reported on the point of being reworked are the Cinnabar mines of Santa Barbara in Huancavolico, in Peru, gold and silver mines in Cauca, and copper mines in Doepar, in Colombia or New Granada.

THE Chilian Government has employed the *Cavadonga* war vessel, Captain Gormaz, on surveying duties. Her work begins at Ancud.

THE TRANSITS OF VENUS IN 2004 AND 2012 *

WHILE preparations are being made by astronomers of various nations for the observation of the approaching Transit of Venus over the sun's disc in December 1874, it may be of interest to know under what conditions the pair of transits in the twenty-first century will take place. This consideration has induced me to make a careful calculation of the circumstances of the transits in 2004 and 2012, from M. Leverrier's Tables of the Sun and Planet, which at present are extremely accurate, and which there can be little doubt will closely represent the phenomena to be witnessed in those years. The calculations have been made entirely by myself, but with every precaution to avoid error, and I have confidence in the results.

The following are the resulting elements of the transit in 2004:—

Greenwich mean time of conjunction in right ascension 2004, June 7d 20h 51m 28s·8.

	°	′	″
Right Ascension of Sun and Venus . .	76	50	28·96
Declination of Sun . .	+22	53	20·4
,, Venus .	+22	42	52·3
Horary motion in R.A. . . Sun . .		2	35·07
,, . . Venus .		−1	47·40
Horary motion in declination Sun . .		+0	13·00
,, ,, Venus .		−0	43·83
Semi-diameter . Sun . .		15	45·74
,, . Venus .			28·75
Horizontal parallax . . . Sun . .			8·78
,, . . . Venus .			30·85
Log. distance of Venus from the Earth .			9·46069

Equation of time . 1m 15s·6 (additive to mean time).

Hence, for the centre of the earth,

		d	h	m	s		°	
First external contact =	June	7	17	3	43	at	115·0	For the *direct* image.
from N. towards E.								
First internal contact =	June	7	17	22	35	at	118·0	
from N. towards E.								
Second internal contact =	June	7	23	5	40	at	214·6	
from N. towards E.								
Second external contact =	June	7	23	24	32	at	218·5	
from N. towards E.								

And l being the geocentric latitude, ρ the radius of the earth at any place, and λ the longitude from Greenwich + E, − W., the reductions for parallax will be obtained from

1st ext. cont. = June 7d 17h 3m 43s $+ [2{\cdot}2198]\rho \,.\sin l - [2{\cdot}5932] \,.\, \rho \,.\, \cos l \,.\, \cos(\lambda + 176^\circ\ 32')$.

1st int. cont. = June 7d 17h 22m 35s $+ [2{\cdot}2571]\rho \,.\sin l - [2{\cdot}5765] \,.\, \rho \,.\, \cos l \,.\, \cos(\lambda + 182^\circ\ 38')$.

2nd int. cont. = June 7d 23h 5m 40s $- [2{\cdot}5090]\rho \,.\sin l + [2{\cdot}4353] \,.\, \rho \,.\, \cos l \,.\, \cos(\lambda + 47^\circ\ 17')$.

2nd ext. cont. = June 7d 23h 24m 32s $- [2{\cdot}4928]\rho \,.\sin l + [2{\cdot}4631] \,.\, \rho \,.\, \cos l \,.\, \cos(\lambda + 54^\circ\ 35')$.

For the Royal Observatory, Greenwich, I find :—

		d	h	m	s	
First external contact,	June	7	17	9	56	Mean times at Greenwich.
,, internal ,,	,,		17	28	51	
Second internal ,,	,,		23	3	24	
,, external ,,	,,		23	22	15	

Therefore the entire transit will be visible at Greenwich.

Similarly, the elements of the transit of 2012 are found to be: Greenwich mean time of conjunction in right ascension 2012, June 5d 13h 4m 44s·3.

	°	′	″
Right ascension of Sun and Venus . .	74	31	11·9
Declination of Sun . .	+22	40	24·1
,, Venus . .	+22	50	3·0
Horary motion in R.A...... ..Sun . .		2	34·67
,, ,, Venus . .		−1	37·70
Horary motion in declination. Sun . .		+0	15·23
,, ,, Venus . .		−0	45·37
Semi-diameter...Sun . .		15	46·01
,, . Venus . .			28·77
Horizontal parallax..............Sun . ,			8·76
,, ,, Venus . .			30·86
Log. distance of Venus from the Earth .			9·46042

Equation of time . 1m 19s·8 (additive to mean time).

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* "Note on the Circumstances of the Transits of Venus over the Sun's Disc in the years 2004 and 2012." From the Proceedings of the Royal Society.

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Hence, for the centre of the earth,

		d	h	m	s		
First external contact from N. towards E.	... June	5	10	22	11	at 40°·3	For the *direct* image
First internal contact from N. towards E.	... June	5	10	39	56	at 37·8	
Second internal contact from N. towards E.	... June	5	16	42	6	at 293·1	
Second external contact from N. towards E.	... June	5	17	0	0	at 290·5	

And, with the same notation as before, I find for the reduction for parallax,

$$\text{1st ext. cont.} = \text{June } 5^d\ 10^h\ 22^m\ 11^s + [2{\cdot}4536]\,\rho\,.\sin l - [2{\cdot}4582]\,.\,\rho\,.\cos l.\ \cos(\lambda + 41^\circ\ 28').$$

$$\text{1st int. cont.} = \text{June } 5^d\ 10^h\ 39^m\ 56^s + [2{\cdot}4838]\,\rho\,.\sin l - [2{\cdot}4558[\,.\,\rho\,.\cos l.\ \cos(\lambda + 43^\circ\ 52').$$

$$\text{2nd int. cont.} = \text{June } 5^d\ 16^h\ 42^m\ 6^s - [2{\cdot}1301]\,\rho\,.\sin l + [2{\cdot}5968]\,.\,\rho\,.\cos l.\ \cos(\lambda - 10^\circ\ 57').$$

$$\text{2nd ext. cont.} = \text{June } 5^d\ 17^h\ 0^m\ 0^s - [2{\cdot}1158]\,\rho\,.\sin l + [2{\cdot}5825]\,.\,\rho\,.\cos l.\ \cos(\lambda - 6^\circ\ 28').$$

At Greenwich the egress only will be visible.

		d	h	m	s	
Last internal contact	June	5 at	16	44	23	Mean times at Greenwich.
,, external	,,	,, at	17	2	15	

The sun will rise at 15h 46m.

J. R. HIND

AMERICAN NOTES

THE year 1871 bids fair to be marked in the history of American science for the great number of exploring expeditions under the auspices of the United States Government. First, that of Captain C. F. Hall, the well-known Arctic traveller, for whose proposed Polar Exploration the United States steamer *Periwinkle* is now being prepared at the Washington Navy-yard. This vessel, of nearly four hundred tons burden, is said to be very staunch and reliable, and her equipment will be of the best order. It is understood that the expedition will start about the end of May, and that Captain Hall's scientific assistants will be Dr. David Walker, formerly known as the surgeon and physicist of Sir Leopold M'Clintock's expedition in the *Fox*, and Dr. Emil Bessels, who has seen Arctic service in a Spitzbergen expedition. Dr. F. V. Hayden, long known to the public as a geologist and explorer, continues his labours of the past season, with the aid of an appropriation by Congress of 40,000 dols. His party is now being fitted out, and will be provided with the necessary assistants in all branches of research. His work will be to the northward of the scene of his last year's explorations. A third expedition is that of Lieutenant G. M. Wheeler, which, under the direction of the War Department, proceeds to explore certain little-known regions of Arizona and Southern Nevada, including the country about the Lower Colorado and Bill Williams Fork. This work will require several years for its completion. Lastly, Major Powell continues his labours during the present season, and expects to make a careful examination of the Canons of Green River as well as of the Colorado.—Attention was called some time ago to the high scientific value of the collection of objects made by the late Dr. Klemm, of Dresden, for use in his "History of the Progress of Human Civilisation;" and it was suggested that in its great extent, and in the harmonious exhibition of illustrations of human art and handicraft in every department, it would constitute an important addition to the means of instruction in the city of New York. An association of parties in Leipsic has accomplished its purchase, at a cost of over ten thousand dollars; and has determined to make it the basis of an international anthropological museum, which, it is expected, will be one of the most complete in the world. Contributions from all parts of the globe, and especially from America, are invited by the committee having the matter in charge, and we trust that the appeal will not be in vain.—Stimulated by the success of the experiment made by the Philadelphians in stocking the Delaware River with black bass, some public-spirited gentlemen of Reading, Pennsylvania, have undertaken to try the same experiment in the Schuylkill, and 350 dollars have already been subscribed for that purpose.—The town of Amherst, in Massachusetts, has followed the example of New York, Philadelphia, Boston, and other places, in introducing English sparrows, in the hope of establishing a colony of these birds.—The San Francisco papers are calling attention to specimens of fossil ivory brought from Alaska; and parties are said to be about entering upon the business of collecting it on a large scale. This ivory consists of the tusks of the mammoth or fossil elephant (*Elephas primigenius*), the remains of which are extremely abundant in Alaska, but much more so in Siberia, from which latter country, as is well known, an appreciable percentage of all the ivory now used in the arts is obtained.—The College of the City of New York in Twenty-third Street, shows a commendable desire to increase its means of instruction in natural history, and particularly in the department of osteology, the president having succeeded by unremitting effort in obtaining means to secure quite a large number of specimens, among which may be especially mentioned a large slab of stone containing a well-preserved skeleton of the *Ichthyosaurus*, or fish-like fossil lizard from the Lias of Germany. The specimen is about ten feet long, and, from its perfection and excellence of preservation, is justly entitled to consideration.

EXPERIMENTS ON THE SUCCESSIVE POLARISATION OF LIGHT, WITH DESCRIPTION OF A NEW POLARISING APPARATUS *

THE term successive polarisation was applied by Biot to denote the effects produced when a ray of polarised light is transmitted through a plate of rock-crystal cut perpendicularly to the axis, or through limited depths of certain liquids. In these cases the plane of polarisation is found to be changed on emergence, and differently for each homogeneous ray, so that, when white light is employed, on turning the analyser round continuously in one direction different colours successively appear, rising or falling in the scale according to the nature of the substance.

If, while the analyser is turned from left to right, the tints ascend (*i.e.* follow the order R, O, Y, G, B, P, V), the substance is said to exhibit right-handed successive polarisation, but if the tints descend, the successive polarisation is said to be left-handed.

These phenomena were satisfactorily explained by Fresnel in the following way. The incident polarised ray, instead of resolving itself into two plane polarised rays at right angles to each other, as in the ordinary cases of dipolarisation, resolves itself in these instances into two circularly polarised rays, one right-handed the other left-handed, which are transmitted with different velocities; each homogeneous ray, thus resolved into two opposite circularly polarised pencils, on emergence composes a ray polarised in a single plane, the deviation of which from the primitive plane of polarisation depends on the difference of phase of the two circularly polarised rays on emergence.

The rotation of the planes of polarisation is from left to right or from right to left, according to whether the right-handed or left-handed circular rays are transmitted with the greater velocity.

The term dipolarisation, proposed by Dr. Whewell to express the bifurcation which a ray of polarised light suffers when it is transmitted through a crystallised plate, is a very appropriate one; but as there are different kinds of such separation, we may designate plane dipolarisation the resolution into two plane-polarised rays at right angles to each other, and circular dipolarisation the resolution into two circularly polarised rays, one right-handed the other left-handed. In like manner the term elliptic dipolarisation may be employed to represent the phenomena shown by transmitting a polarised ray through a plate of rock-crystal obliquely to the axis.

The object of the present communication is to make known another means of producing successive polarisation, both right-handed and left-handed, which, equally with the well-known modes, may be proved to arise from the interference of two opposite systems of circularly polarised rays.

The polarising apparatus which I have employed for the experiments I am about to detail is represented by Fig. 1.

A plate of black glass, G, is fixed at an angle of 3° to the horizon. The film to be examined is to be placed on a diaphragm, D, so that the light reflected at the polarising angle from the glass plate shall pass through it at right angles, and after reflection at an angle of 18° from the surface of a polished silver

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